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The Poverty–Land Degradation Nexus in Karamoja, Uganda: A Conceptual Review

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Abstract
Background: Karamoja, a semi-arid dryland region in northeastern Uganda, exhibits some of the highest poverty rates in sub-Saharan Africa alongside severe land degradation. Understanding the reciprocal relationships between poverty and environmental decline is critical for sustainable development policy.
Objectives: This conceptual review synthesizes existing literature to elucidate the multidimensional poverty–land degradation nexus in Karamoja, identify feedback mechanisms, and assess institutional and governance dimensions shaping this relationship.
Methods: A narrative conceptual review was conducted using systematic literature searches across academic databases (Google Scholar, Web of Science, PubMed, Scopus) with keywords including "Karamoja," "poverty," "land degradation," "pastoralism," "livelihoods," and "Uganda." Inclusion criteria prioritized peer-reviewed articles, grey literature, and policy documents published between 1998 and 2026. Thematic synthesis was employed to organize findings around poverty dimensions, degradation drivers, feedback pathways, and governance structures.
Results: Karamoja's poverty is multidimensional, encompassing extreme income poverty (82% living below $1/day), livestock asset depletion, chronic food insecurity, infrastructure deficits, and capability deprivation. Land degradation manifests through soil erosion, rangeland deterioration, deforestation driven by charcoal production, and climate variability. Bidirectional feedback pathways exist: poverty compels resource-depleting coping strategies (charcoal burning, overgrazing), while degradation reduces productivity and deepens impoverishment. Institutional factors including commons enclosure, disarmament policies, tenure insecurity, and sedentarization programs mediate and often exacerbate these dynamics.
Conclusion: The poverty–land degradation nexus in Karamoja is not a deterministic spiral but a conditional, institutionally mediated process. Breaking this cycle requires integrated interventions addressing tenure security, climate adaptation, livelihood diversification, and recognition of adaptive pastoral mobility. Future research should prioritize longitudinal socio-ecological studies and gender-disaggregated analyses.

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1. Introduction

Land degradation and rural poverty represent intertwined challenges confronting dryland regions globally, with particularly acute manifestations across sub-Saharan Africa [32, 51]. Drylands characterized by low and highly variable precipitation, fragile soils, and sparse vegetation support approximately 2 billion people worldwide, many of whom depend on rain-fed agriculture

and extensive livestock systems for their livelihoods [58]. In these environments, the relationship between poverty and environmental degradation has long been conceptualized as a vicious cycle: impoverished populations, lacking alternative livelihood options, overexploit natural resources to meet immediate survival needs, thereby accelerating land degradation; in turn, degraded lands yield diminished productivity, trapping communities in deepening poverty [45, 32].

However, this neo-Malthusian narrative has been increasingly challenged by political ecology and institutional economics perspectives, which emphasize the roles of power relations, historical marginalization, governance failures, and tenure insecurity in driving both poverty and environmental decline [18, 30, 41]. Contemporary scholarship recognizes that the poverty–environment nexus is neither universal nor deterministic but is instead mediated by context-specific social, political, and ecological factors [61, 54].

Karamoja, a semi-arid region in northeastern Uganda, provides a compelling case for examining these complex dynamics. Home to approximately 1.3 million predominantly pastoralist and agro-pastoralist people, Karamoja exhibits some of the most severe poverty indicators in Uganda and East Africa more broadly [64, 67]. Approximately 82% of the population survives on less than one US dollar per day, compared to a national average of 31%. Chronic food insecurity affects the majority of households, with up to 48% dependent on food aid [64]. Concurrently, the region experiences pronounced land degradation, including soil erosion, rangeland deterioration, deforestation, and declining vegetation cover [2, 72, 63].

The Karamoja context is further complicated by a turbulent socio-political history. Colonial and post-colonial policies systematically enclosed common grazing lands, restricted pastoral mobility, and imposed sedentarization programs ill-suited to the region's ecological conditions [2, 72]. The proliferation of firearms in the 1970s and 1980s, followed by government-led disarmament campaigns and the establishment of army-controlled cattle herding, disrupted traditional resource management institutions and exacerbated both insecurity and impoverishment [2, 72]. More recently, large-scale land acquisitions for mining and conservation have further constrained access to critical pastoral resources [64, 73].

Despite growing scholarly attention to Karamoja's development challenges, a comprehensive conceptual synthesis of the poverty–land degradation nexus, integrating ecological, economic, social, and institutional dimensions remains lacking. Existing studies tend to focus on isolated aspects: climate impacts on food security [74, 67], livelihood dynamics [65], commons management [2, 72], or land-use change [73, 62]. A holistic conceptual framework is needed to understand how these dimensions interact and reinforce one another, and to identify leverage points for intervention.

1.1. Conceptual Foundations

This review is grounded in three complementary conceptual frameworks. First, the sustainable livelihoods framework [7] provides a lens for analyzing how households mobilize diverse capital assets (natural, physical, human, financial, social) within vulnerability contexts shaped by shocks, trends, and seasonality, mediated by institutions and policies. Second, political ecology perspectives [13, 18, 30] direct attention to power relations, historical processes of marginalization, and the ways state policies and market forces shape resource access and environmental outcomes. Third, new institutional economics emphasizes the role of property rights, governance structures, and transaction costs in determining resource management outcomes [26].

Land degradation is defined here as a persistent decline in the productive capacity of land and its ability to provide ecosystem services, resulting from soil erosion, nutrient depletion, vegetation loss, and hydrological changes [51, 52]. In dryland contexts, degradation is often driven by interactions among climate variability, land-use intensification, and institutional failures [58, 14].

Rural poverty is conceptualized multidimensionally, extending beyond income deficits to encompass asset deprivation, food insecurity, limited access to services and infrastructure, social exclusion, and constrained capabilities to achieve valued functioning [5]. In pastoral contexts, livestock ownership serves as the primary measure of wealth and social status, making livestock loss a critical dimension of impoverishment [23, 65].

Nexus thinking emphasizes the interconnectedness and feedback loops between poverty and land degradation, recognizing that causality flows in both directions and is mediated by contextual factors [54, 61]. This approach moves beyond linear cause-effect models to embrace complexity and contingency.

1.2. Knowledge Gap and Objectives

While the general poverty–environment nexus has been extensively theorized [32, 45, 61], empirical understanding of how this nexus operates in specific dryland pastoral contexts remains limited. Karamoja's unique combination of extreme poverty, pronounced land degradation, disrupted pastoral institutions, and ongoing policy interventions makes it an important case for advancing conceptual understanding.

The aim of this review is to synthesize existing knowledge on the poverty–land degradation nexus in Karamoja, Uganda, through a conceptual lens that integrates ecological, socioeconomic, and institutional dimensions. The Specific objectives are to: (1). Characterize the multidimensional nature of poverty in Karamoja, with attention to pastoral and agro-pastoral livelihoods. (2) Identify and analyze the key land degradation processes and their proximate and underlying drivers. (3) Explain the bidirectional feedback pathways linking poverty and land degradation. (4). Examine the role of institutions, governance, and policy in shaping the nexus. (5) Identify critical knowledge gaps and priorities for future research and policy intervention.

2. Methods

2.1. Review Design

This study employed a narrative conceptual review methodology [57, 60], designed to synthesize and critically interpret existing literature on the poverty–land degradation nexus in Karamoja. Unlike systematic reviews that aim for exhaustive coverage and meta-analysis, narrative conceptual reviews prioritize thematic integration, theoretical development, and the identification of patterns, contradictions, and knowledge gaps across diverse sources [57].

2.2. Literature Search Strategy

A comprehensive literature search was conducted across Google Scholar, Web of Science, PubMed, Scopus, and

African Journals Online (AJOL) to identify relevant publications published between 1998 and 2026. The search strategy combined geographic, thematic, and sectoral keywords using Boolean operators (AND and OR) to capture literature on the interrelationships between poverty, land degradation, and sustainable livelihoods in Karamoja, Uganda. Geographic search terms included "Karamoja," "Karimojong," and "northeastern Uganda," while thematic terms included "poverty," "land degradation," "desertification," "soil erosion," "rangeland degradation," and "deforestation." These were combined with sectoral terms such as "pastoralism," "agro-pastoralism," "livelihoods," "food security," and "climate change." Additional searches were conducted using broader terms, including "sub-Saharan African drylands," "East African pastoralism," and "poverty-environment nexus," to situate findings from Karamoja within wider regional and comparative dryland contexts. In addition to peer-reviewed academic literature, grey literature was reviewed to incorporate relevant policy perspectives and institutional evidence. Sources included reports published by the Food and Agriculture Organization (FAO) [1, 2], the World Bank [6, 8], and CGIAR [3], alongside relevant Ugandan government policy documents, particularly the National Development Plan III and the Uganda Land Act. This approach enabled the identification of empirical studies, conceptual contributions, and policy analyses relevant to understanding the complex relationships between rural poverty, environmental change, pastoral livelihoods, and sustainable development in Karamoja.

2.3. Inclusion and Exclusion Criteria

The review considered peer-reviewed journal articles, scholarly books and book chapters, theses and dissertations, and credible grey literature published in English. Eligible publications included empirical studies, conceptual papers, theoretical works, and policy analyses examining poverty, land degradation, pastoralism, rural livelihoods, climate change, environmental change, natural resource management, and governance in Karamoja or comparable dryland pastoral settings. Publications were excluded if they focused on non-dryland or non-pastoral contexts without clear relevance to the review, lacked sufficient methodological transparency or credibility, duplicated other sources, or were conference abstracts without accessible full-text papers.

2.4. Thematic Synthesis

Thematic synthesis was employed as per [57], to organize and interpret the identified literature under four interrelated conceptual categories: (1) the dimensions and drivers of rural poverty in Karamoja; (2) the processes and underlying drivers of land degradation; (3) the feedback mechanisms linking poverty and land degradation; and (4) the institutional and governance factors shaping these relationships. Within each theme, relevant sub-themes were identified inductively from the reviewed literature, allowing recurring patterns, relationships, and emerging issues to be explored. The findings were then integrated into a coherent narrative to explain how socioeconomic conditions, environmental change, livelihood practices, and governance arrangements interact within the Karamoja context. Where studies presented contrasting findings or interpretations, these differences were acknowledged and examined. Gaps in the existing literature were also identified to highlight areas requiring further research and to inform the development of the conceptual review's central arguments.

2.5. Conceptual Framework Integration

The synthesis was guided by the sustainable livelihood's framework [7], political ecology [13, 18], and institutional economics [26] perspectives, as outlined in the Introduction. These frameworks provided analytical lenses for interpreting empirical findings and identifying underlying mechanisms.

2.6. Ethical Considerations

This review relied exclusively on secondary data from published and publicly available sources. No primary data collection was conducted, and therefore no ethical approval was required.

2.7. Limitations

As a narrative conceptual review, this study does not claim exhaustive coverage of all relevant literature. The synthesis reflects the authors' interpretive judgments regarding thematic organization and conceptual integration. Publication bias toward studies reporting significant relationships may influence the evidence base. Additionally, much of the literature on Karamoja is relatively recent, and longitudinal data remain limited, constraining the ability to assess temporal dynamics rigorously.

3. Results

3.1. Dimensions and Drivers of Rural Poverty in Karamoja

Poverty in Karamoja is a multidimensional phenomenon that extends far beyond income deficits to encompass asset depletion, food insecurity, infrastructure deficits, social exclusion, and capability deprivation [65, 64, 72]. This section synthesizes evidence on the key dimensions and underlying drivers of poverty in the region.

3.1.1 Income Poverty and Monetary Deprivation

Karamoja exhibits extreme income poverty by both national and international standards. Approximately 82% of the region's 1.3 million inhabitants survive on less than one US dollar per day, compared to a national Ugandan average of 31% [64, 67]. In some districts, poverty rates reach 87–91% [72]. These figures position Karamoja among the poorest regions in sub-Saharan Africa [64].

Low-income levels are driven by multiple factors, including limited market access, low agricultural productivity, restricted livelihood diversification opportunities, and historical economic marginalization [73]. The region's geographic isolation, poor road infrastructure, and long distances to markets constrain participation in commercial exchange and reduce purchasing power [69]. Households often lack cash crops and face difficulties accessing formal credit or financial services [73].

3.1.2 Livestock Asset Poverty

In pastoral and agro-pastoral societies, livestock ownership is the primary measure of wealth, social status, and livelihood security [23]. Karamoja has experienced a dramatic decline in livestock ownership over recent decades, driven by violent cattle raiding, government disarmament campaigns, droughts, and disease outbreaks [72]. The severe loss of cattle, the most valued asset has resulted in widespread

impoverishment, social exclusion, and loss of cultural identity [65].

Households with fewer livestock face heightened vulnerability to food insecurity, as they lack the buffer provided by milk production, meat, and the ability to sell or exchange animals during crises [70]. Approximately 70% of food-secure households own livestock, compared to less than 60% of food-insecure households [20]. The concentration of remaining cattle under army-controlled herding arrangements has further marginalized poor households, particularly women and young men, from access to this critical asset [65].

3.1.3 Chronic Food Insecurity

Food insecurity is pervasive and chronic in Karamoja. Up to 48% of households depend on food aid, and the region has relied on World Food Programme (WFP) assistance since the 1960s [64, 21]. Acute food shortages are driven by recurrent droughts, erratic rainfall, crop failures, and declining livestock productivity [68, 74]. Climate variability manifested as prolonged dry spells, flash floods, and unpredictable rainfall patterns undermines both crop and livestock production [69, 63].

Poor food consumption habits, inadequate dietary diversity, and high rates of child malnutrition compound food insecurity [21]. Food insecurity severely impacts human development, constraining children's education and primary school attendance [67]. Households adopt negative coping strategies, including increased reliance on wild plant foods, distress migration, and asset depletion [68, 67].

3.1.4 Infrastructure Deficits and Service Access

Karamoja suffers from profound infrastructure deficits, including poor road networks, inadequate water supply systems, limited health facilities, and low educational infrastructure [72, 21]. Many water sources, such as valley tanks and dams, are vandalized, poorly maintained, or lack functional management committees [70]. The destruction of physical assets including roads, markets, and water points further constrains livelihood opportunities and access to services [63].

Educational infrastructure is particularly weak, with high illiteracy rates and the lowest education levels in Uganda [73]. Approximately 61% of the population experiences extreme poverty alongside high child mortality rates and widespread unemployment [21]. These structural deficits limit human capital development and constrain households' ability to pursue alternative livelihoods [73].

3.1.5 Social Exclusion and Marginalization

Karamoja's poverty is deeply rooted in historical and ongoing social exclusion and political marginalization [72, 64]. Colonial and post-colonial governments have systematically marginalized the Karimojong, viewing pastoralism as backward and imposing policies aimed at sedentarization and agricultural modernization [2, 21]. Ethnic marginalization, lack of political voice, and exclusion from national development planning have perpetuated the region's underdevelopment [20]. Within Karamoja, social differentiation creates intra-community inequalities. Young men, having lost access to cattle through disarmament and raiding, experience marginalization and lack of voice in decision-making. Women face heightened vulnerability due to limited access to livestock, land, and decision-making power, alongside increased domestic violence [65]. Gender-based violence, early child marriages, and school dropouts are manifestations of multidimensional poverty [73].

3.1.6 Capability Deprivation

Drawing on Sen's capability approach [5], poverty in Karamoja can be understood as a deprivation of capabilities; the freedoms and opportunities to achieve valued functioning. Widespread illiteracy, lack of legal awareness regarding land and human rights, and limited access to information constrain households' ability to navigate formal institutions and assert their rights [64, 73]. External exploitation by state policies and commercial interests has destroyed pastoral and agricultural modes of existence, causing severe capability deprivation and economic marginalization [19].

The disruption of traditional pastoral institutions including customary land tenure systems, mobility patterns, and social safety nets has eroded the social capital and adaptive capacity that historically enabled Karamojong communities to cope with environmental variability [2, 72].

3.1.7 Climate Vulnerability and Environmental Shocks

Karamoja's semi-arid climate is characterized by low and highly variable rainfall, frequent droughts, and increasing temperatures [67, 69, 74]. Climate variability and change exacerbate poverty by undermining agricultural and livestock productivity, reducing water availability, and increasing the frequency and severity of shocks [63, 66]. Recurrent droughts cause livestock mortality, crop failures, and acute food shortages, pushing households into transient and chronic poverty [66, 69].

Climate-driven pest outbreaks, including invasive species and crop pests, further threaten food security and livelihoods [9, 63]. The interaction of climate shocks with existing vulnerabilities such as asset poverty, infrastructure deficits, and weak governance amplifies poverty outcomes [66].

3.1.8 Conflict, Insecurity, and Livelihood Disruption

Violent conflict, particularly cattle raiding, has been a persistent feature of Karamoja's recent history [2, 20]. The mass acquisition of firearms in the 1970s and 1980s intensified raiding, leading to widespread livestock loss, displacement, and insecurity [2, 72]. Government disarmament campaigns, while reducing violence, also disrupted pastoral mobility and concentrated cattle under military control, marginalizing poor households [65].

Insecurity constrains livelihood activities, limits access to grazing lands and water sources, and undermines social cohesion [67, 69]. Resource conflicts, driven by competition over shrinking grazing lands and water, further destabilize communities and exacerbate poverty [16].

3.2. Land Degradation Processes and Drivers in Karamoja

Land degradation in Karamoja manifests through multiple interrelated processes, including soil erosion, rangeland deterioration, deforestation, and vegetation cover change [63]. This section synthesizes evidence on the key degradation processes and their proximate and underlying drivers.

3.2.1 Soil Erosion and Nutrient Depletion

Soil erosion is widespread in Karamoja, driven by the region's hilly terrain, intense rainfall events, and removal of vegetation cover [19]. Catchments characterized by gentle and

steep slopes are particularly vulnerable to intense soil erosion [63]. The loss of woody cover increases surface runoff and decreases water retention, exacerbating erosion [72].

Concentrated livestock numbers in protected kraals (manyattas) during the disarmament era caused forced overgrazing, soil compaction, and erosion [72, 19]. High grazing intensity and direct livestock watering destroy dam embankments, causing siltation and rangeland degradation [70]. Trampling around waterholes and kraal further degrades soils [20].

Nutrient depletion results from continuous cropping without adequate inputs, removal of crop residues, and erosion of topsoil [22]. The expansion of subsistence croplands into marginal areas, driven by sedentarization policies and population growth, accelerates nutrient mining [20, 22].

3.2.2 Rangeland Degradation and Vegetation Change

Rangeland degradation is a central concern in Karamoja, manifested as declining forage quality and quantity, bush encroachment, and loss of palatable grass species [17]. Bushland encroachment has increased significantly over the past decade, reducing the availability of open grasslands critical for livestock grazing [23, 20].

High grazing pressure constrains palatable plant seed development, promoting the proliferation of undesirable weeds and unpalatable species [23]. Heavy grazing causes biodiversity loss and shifts in species composition toward less nutritious forage [72]. The breakdown of traditional grazing calendars and mobility patterns, due to conflict and policy restrictions, has intensified localized grazing pressure [2].

Intense fires, both natural and anthropogenic, destroy seeds and limit recruitment of leguminous plants, further degrading rangeland quality [23]. However, the cessation of annual grass burning a traditional management practice has led to the proliferation of harvester ants and termites, which also degrade vegetation [19].

3.2.3 Deforestation and Woody Cover Loss

Deforestation is driven primarily by charcoal production, firewood harvesting, and brickmaking, which consume large quantities of wood [72, 63, 65]. Charcoal burning has emerged as a critical coping strategy for impoverished households, particularly those who have lost livestock [10]. Tree felling for charcoal, firewood, and homestead hedging exposes landscapes to wind erosion and increases evaporation from water bodies [70].

Increased cutting of hardwood trees for charcoal and firewood, alongside the expansion of subsistence croplands, drives deforestation [20]. Mountain slope clearing for grazing and burning further contributes to woody cover loss [19]. The removal of woody vegetation reduces water retention, increases runoff, and diminishes habitat for biodiversity [72].

3.2.4 Climate Variability and Extreme Weather

Climate variability is both a driver and consequence of land degradation in Karamoja [74]. The region experiences high interannual and intra-annual rainfall variability, frequent droughts, erratic rainfall patterns, and increasing temperatures [69, 23]. Prolonged dry spells and flash floods disrupt vegetation growth and exacerbate soil erosion [67, 63].

Increased temperatures and evapotranspiration lead to severe surface water inadequacy and drought stress [17]. A deficit in average annual rainfall of approximately 15% compounds drought challenges [23]. Climate-driven changes in precipitation patterns and temperature regimes interact with land-use pressures to accelerate degradation [74].

3.2.5 Land-Use Change and Agricultural Expansion

Dramatic cropland expansion occurred in Karamoja between 2000 and 2012, driven by government sedentarization policies, population growth, and livelihood diversification [21, 24]. Agricultural expansion into fertile grasslands and riverine areas restricts pastoral mobility, cuts transhumant livestock routes, and reduces the availability of key grazing resources [65, 4].

The conversion of rangelands to cropland exposes soils to erosion, reduces vegetation cover, and disrupts hydrological processes [24]. Cultivation causes grassland shrinking, alongside grass harvesting for hut thatching. The expansion of farming and crop production removes natural vegetation, leaving soils vulnerable to erosion [22].

Large-scale land acquisitions for mining, conservation, and commercial agriculture further constrain pastoral land access [21, 73]. Mining activities destroy surface soil, pasture, and vegetation, leaving deep open pits and producing domestic and industrial effluents that pollute land and water resources [64, 73].

3.2.6 Governance, Tenure Insecurity, and Institutional Breakdown

Underlying many proximate drivers of land degradation are governance failures and tenure insecurity [21]. Historical enclosure of common grazing lands by colonial and post-colonial governments curtailed traditional pastoral practices and restricted mobility. Forced sedentarization, disarmament, and the establishment of army-controlled cattle herding disrupted customary resource management institutions [2].

Tenure insecurity, lack of land titles, and unclear property rights undermine incentives for sustainable land management [21]. The conversion of over 90% of land to conservation and buffer zones restricts pastoral access to critical resources [19]. Illegal or exploitative mining activities, weak enforcement of environmental regulations, and lack of community participation in land-use planning exacerbate degradation [64].

3.3. Feedback Pathways: How Poverty and Land Degradation Reinforce Each Other

The relationship between poverty and land degradation in Karamoja is characterized by bidirectional feedback pathways, wherein each condition exacerbates the other [32, 49]. This section synthesizes evidence on these feedback mechanisms and the factors that mediate them.

3.3.1 Forward Pathway: Poverty Drives Land Degradation

Poverty compels households to adopt resource-depleting coping strategies that accelerate land degradation [32]. Impoverished households, having lost livestock and lacking alternative income sources, turn to charcoal production, firewood harvesting, and brickmaking to generate cash [10]. These activities drive deforestation, soil degradation, and loss of woody cover [63].

Charcoal burning, in particular, has emerged as a critical survival strategy for the poorest households in Karamoja [2]. The need to raise school fees and cover educational costs further drives tree-cutting and charcoal production [21]. Brickmaking in traditional earth mound kilns consumes large

quantities of wood and water, contributing to deforestation and soil degradation [65, 22].

Asset poverty, particularly livestock loss, reduces households' ability to invest in sustainable land management practices, such as soil conservation, agroforestry, or improved grazing management [50]. Poor households lack the financial capital to purchase inputs, the labor to implement conservation measures, or the tenure security to justify long-term investments [49, 56].

Food insecurity drives agricultural expansion into marginal lands, including steep slopes and fragile rangelands, where cultivation accelerates erosion and nutrient depletion [24]. The pressure to meet immediate food needs overrides concerns about long-term sustainability [32].

3.3.2 Reverse Pathway: Land Degradation Deepens Poverty

Land degradation reduces the productivity of agricultural and pastoral systems, thereby deepening poverty [29]. Soil erosion and nutrient depletion lower crop yields, reducing food availability and household income [49, 50]. Rangeland degradation diminishes forage quality and quantity, leading to livestock mortality, reduced milk production, and lower herd growth rates [15].

Degraded rangelands force pastoralists to travel longer distances in search of pasture and water, increasing labor demands, transaction costs, and exposure to conflict [33]. The loss of key grazing resources, such as riverine grasslands and dry-season pastures, undermines the viability of pastoral livelihoods [4].

Deforestation and vegetation loss reduce the availability of wild plant foods, fuelwood, and construction materials, which are critical for subsistence and income generation [68, 34]. The degradation of ecosystem services including water regulation, soil fertility, and biodiversity further constrains livelihood options [8, 48].

Households experiencing productivity losses due to degradation face heightened vulnerability to shocks, such as droughts and price fluctuations [50]. The erosion of natural capital reduces resilience and adaptive capacity, trapping households in chronic poverty [9, 23].

3.3.3 Mediating Factors: Institutions, Mobility, and Social Protection

The strength and direction of poverty–land degradation feedback loops are mediated by contextual factors, including institutions, mobility, asset endowments, and social protection mechanisms [33, 1, 5].

Institutions and governance: Secure land tenure, effective resource governance, and functional collective action institutions can break feedback loops by incentivizing sustainable management and enabling long-term investment [26, 56]. Conversely, tenure insecurity, weak enforcement, and exclusionary policies exacerbate both poverty and degradation [21, 56].

Pastoral mobility: Adaptive mobility is a cornerstone of sustainable rangeland management in drylands, allowing herds to track spatially and temporally variable forage resources while enabling pasture recovery [3, 18, 30]. Restrictions on mobility due to conflict, land enclosures, or sedentarization policies intensify localized grazing pressure and accelerate degradation [72, 33]. Conversely, restoring mobility can enhance both ecological sustainability and livelihood security [3, 31].

Asset endowments: Households with diverse asset portfolios (livestock, land, human capital, social networks) are better able to withstand shocks and avoid resource depleting coping strategies. Asset-poor households, lacking buffers, are more vulnerable to poverty traps [9, 23].

Social protection: Safety nets, such as cash transfers, food aid, and livestock restocking programs, can reduce the pressure on households to overexploit natural resources [8]. However, poorly designed interventions such as food aid that undermines local markets or restocking programs that exceed rangeland carrying capacity can inadvertently exacerbate degradation [1].

3.3.4 Conditional vs. Universal Cycle: A Nuanced Perspective

While the poverty–land degradation nexus is often portrayed as a universal vicious cycle, empirical evidence from Karamoja and comparable dryland contexts reveals a more nuanced picture [42, 57]. Not all poor households degrade land, and not all degraded lands are associated with poverty [32, 41]. The nexus is conditional, contingent on specific ecological, social, and institutional contexts [32, 57].

In some cases, poverty may drive sustainable resource use, as poor households lack the capital to intensify production or clear forests [32]. Conversely, wealthier households with larger herds or access to mechanized agriculture may exert greater environmental pressure [11, 36]. Political and economic elites, rather than the poor, are often the primary drivers of large-scale land degradation through commercial logging, mining, and land grabbing [64].

The "blaming the poor" narrative has been critiqued for obscuring the structural drivers of degradation, including historical marginalization, policy failures, and market forces [46]. A political ecology perspective emphasizes that degradation is often driven by power imbalances, insecure tenure, and the imposition of inappropriate development models [18, 30].

3.4. Institutional and Governance Dimensions

Institutions and governance structures play a central role in shaping the poverty–land degradation nexus in Karamoja [26]. This section examines customary land tenure, formal policy frameworks, conflict and disarmament, and donor interventions.

3.4.1 Customary Land Tenure and Commons Management

Historically, Karamoja's rangelands were managed as common-pool resources under customary tenure systems governed by elders' councils, clan-based reciprocal access arrangements, and seasonal grazing calendars. These institutions enabled adaptive mobility, facilitated risk-sharing, and maintained the productivity of pastures through rotational grazing and periodic resting [2].

However, colonial and post-colonial governments systematically enclosed common grazing lands, viewing communal tenure as inefficient and pastoralism as backward. Repeated enclosures curtailed traditional practices, restricted mobility, and undermined customary institutions [72]. The imposition of sedentarization policies and the establishment of protected areas further fragmented rangelands and constrained pastoral access [19]. The breakdown of customary institutions has weakened collective action, eroded social capital, and reduced adaptive capacity [20]. Without functional

governance structures, rangelands are vulnerable to overgrazing, encroachment, and degradation [2, 72].

3.4.2 Formal Policy Frameworks

Uganda's formal policy frameworks relevant to Karamoja include the Uganda Land Act (1998), which recognizes customary tenure but also enables land titling and conversion to freehold; the National Development Plan III (NDP III), which prioritizes agricultural modernization and commercialization; and agricultural programs such as the National Agricultural Advisory Services (NAADS) and Operation Wealth Creation (OWC), which promote crop production and livestock improvement [64].

While these policies aim to reduce poverty and enhance productivity, they often reflect a bias toward sedentary agriculture and fail to recognize the ecological rationality and economic viability of pastoralism [28]. Sedentarization policies, in particular, are ill-suited to Karamoja's semi-arid conditions, where rainfall is insufficient for sustainable rainfed crop production [2, 21].

The Uganda Land Act's provisions for land titling and conversion to freehold tenure create risks of dispossession for pastoralists, who lack legal literacy and formal documentation. Large-scale land acquisitions for mining and conservation, facilitated by weak regulatory oversight, have further marginalized pastoral communities [64, 73].

3.4.3 Conflict, Disarmament, and Livelihood Disruption

The proliferation of firearms in Karamoja during the 1970s and 1980s intensified cattle raiding, leading to widespread livestock loss, displacement, and insecurity. Government-led disarmament campaigns, initiated in the early 2000s, succeeded in reducing violence but also disrupted pastoral livelihoods [72].

Disarmament was accompanied by the establishment of army-controlled cattle herding, which concentrated remaining livestock under military protection and marginalized poor households from access [65]. This "radical enclosure of the commons" by the government exacerbated impoverishment and necessitated the emergence of new, potentially environmentally detrimental livelihoods, such as charcoal production and brickmaking. The legacy of conflict and disarmament continues to shape livelihood dynamics, resource access, and social relations in Karamoja [20].

3.4.4 Donor Interventions and Their Limitations

Karamoja has been the focus of numerous donor-funded interventions aimed at reducing poverty, enhancing food security, and promoting sustainable land management. These include resilience-building programs, livestock restocking, agricultural extension, water infrastructure development, and social protection initiatives [1, 8].

While some interventions have achieved positive outcomes, many have been criticized for failing to address underlying structural drivers of poverty and degradation. Top-down approaches that do not engage local communities, recognize customary institutions, or respect pastoral knowledge systems often prove ineffective or counterproductive [2, 28].

Food aid, while providing critical short-term relief, can undermine local markets, create dependency, and disincentivize production. Livestock restocking programs that do not account for rangeland carrying capacity or address governance failures may exacerbate overgrazing [1].

Effective interventions require integrated approaches that combine livelihood support, tenure security, climate adaptation, and institutional strengthening, grounded in participatory processes and respect for local knowledge [47].

4. Discussion

4.1. Interpreting the Nexus Through Conceptual Lenses

The findings synthesized in this review reveal that the poverty–land degradation nexus in Karamoja is a complex, multidimensional, and institutionally mediated process, rather than a simple deterministic spiral. Interpreting these findings through the sustainable livelihood's framework [7], political ecology [13, 18, 30,] and institutional economics lenses provides deeper insights.

From a livelihoods perspective, Karamoja's poverty reflects the erosion of multiple capital assets; natural (rangelands, soils, water), physical (infrastructure, livestock), human (education, health), financial (income, credit), and social (networks, institutions) within a vulnerability context shaped by climate variability, conflict, and policy shocks [7]. Land degradation further depletes natural capital, reducing the asset base upon which livelihoods depend. Breaking the nexus requires rebuilding diverse capital assets and strengthening adaptive capacity [1].

Political ecology perspectives highlight that poverty and degradation in Karamoja are not merely outcomes of resource scarcity or population pressure but are deeply rooted in historical marginalization, power imbalances, and policy failures [18, 30, 41]. Colonial and post-colonial enclosures, sedentarization policies, disarmament, and large-scale land acquisitions reflect the imposition of state and market logics that undermine pastoral institutions and livelihoods [72, 64]. The "blaming the poor" narrative obscures these structural drivers and shifts responsibility away from powerful actors [32, 41].

Institutional economics emphasizes that secure property rights, effective governance, and low transaction costs are critical for sustainable resource management [26, 56]. Tenure insecurity, weak enforcement, and the breakdown of customary institutions in Karamoja undermine incentives for long-term investment and collective action [56]. Restoring functional institutions whether customary, formal, or hybrid is essential for breaking feedback loops [26].

4.2. Comparative Perceptions from Analogous Dryland Regions

Karamoja's poverty–land degradation nexus shares commonalities with other dryland pastoral regions in sub-Saharan Africa, including the Sahel, the Horn of Africa, and Southern Africa [1, 5, 8]. Across these regions, poverty is multidimensional, encompassing asset depletion, food insecurity, and social exclusion [12, 25, 27]. Land degradation manifests through soil erosion, rangeland deterioration, and deforestation, driven by climate variability, land-use change, and governance failures [14, 39, 52].

Bidirectional feedback loops between poverty and degradation are widely documented [49, 50, 15, 29]. However, the strength and direction of these loops vary by context, mediated by institutions, mobility, and asset endowments [33]. In the Kalahari, for example, adaptive mobility and diverse livelihood portfolios enable pastoralists to maintain resilience despite climate variability [1, 5]. In the Sahel, social protection programs and community-based natural resource

management have shown promise in breaking poverty traps [43, 44].

Comparative analysis reveals that pastoral mobility is a critical factor distinguishing sustainable from degraded systems [18, 30]. Where mobility is maintained, rangelands remain productive and livelihoods resilient [3, 31]. Where mobility is restricted as in Karamoja, degradation accelerates and poverty deepens [33].

4.3. Competing Explanations: Neo-Malthusian vs. Political Ecology vs. Institutional Economics

Three broad explanatory frameworks dominate the literature on the poverty–environment nexus: neo-Malthusian, political ecology, and new institutional economics [32, 58, 26].

Neo-Malthusian perspectives emphasize population pressure and resource scarcity as primary drivers of degradation, positing that growing populations overexploit finite resources, leading to environmental collapse and poverty. This view has historically informed policies promoting population control, sedentarization, and agricultural intensification [58].

However, neo-Malthusian explanations have been widely critiqued for oversimplifying complex dynamics, ignoring institutional and political factors, and blaming the poor for degradation [41, 18]. In Karamoja, population density is relatively low, and degradation is driven more by policy failures, conflict, and tenure insecurity than by population pressure [72].

Political ecology perspectives challenge neo-Malthusian narratives by emphasizing power relations, historical processes, and the role of state and market forces in shaping resource access and environmental outcomes [41]. This view highlights that degradation often results from marginalization, dispossession, and the imposition of inappropriate development models [18, 30]. In Karamoja, political ecology provides a compelling explanation for how colonial and post-colonial policies, conflict, and land grabbing has driven both poverty and degradation [64].

New institutional economics focuses on property rights, governance structures, and transaction costs as determinants of resource management outcomes. Secure tenure, effective enforcement, and functional collective action institutions incentivize sustainable management, while tenure insecurity and governance failures lead to degradation [26]. In Karamoja, the breakdown of customary institutions and the lack of formal tenure security are central to the nexus [56].

This review suggests that an integrated perspective, combining perceptions from political ecology and institutional economics, provides the most inclusive understanding of the Karamoja nexus. Poverty and degradation are driven by structural factors and institutional failures (tenure insecurity, governance breakdown), rather than by population pressure or resource scarcity alone.

4.4. Policy Implications

The conceptual synthesis presented in this review has several implications for policy and practice in Karamoja and comparable dryland pastoral contexts.

First, policies must recognize the ecological rationality and economic viability of pastoralism, rather than imposing sedentarization and agricultural modernization models ill-suited to semi-arid conditions [28, 59]. Adaptive mobility should be supported, not restricted, as it is essential for sustainable rangeland management and livelihood resilience [3, 31, 53].

Second, tenure security is foundational for breaking poverty–land degradation feedback loops [26, 56]. Strengthening customary tenure systems, clarifying property rights, and protecting pastoral communities from land grabbing are critical priorities [64, 73, 56].

Third, integrated interventions are needed that address multiple dimensions of poverty and degradation simultaneously, including livelihood diversification, climate adaptation, social protection, and institutional strengthening [8]. Separate, sector-specific programs are unlikely to achieve transformative change [47].

Fourth, participatory approaches that engage local communities, respect indigenous knowledge, and build on existing institutions are more likely to succeed than top-down interventions [28, 38]. Community-based natural resource management, participatory land-use planning, and co-management arrangements can enhance both sustainability and equity [55].

Fifth, addressing the legacy of conflict and insecurity is essential for restoring livelihoods and enabling sustainable resource management [46]. Peace building, conflict resolution, and equitable access to resources must be integrated into development programming [67].

4.5. Limitations of the Review

This narrative conceptual review has several limitations. First, as a non-systematic review, it does not claim exhaustive coverage of all relevant literature, and the synthesis reflects the authors' interpretive judgments. Second, much of the literature on Karamoja is relatively recent, and longitudinal data remain limited, constraining the ability to assess temporal dynamics rigorously. Third, publication bias toward studies reporting significant relationships may influence the evidence base. Fourth, the review relies on secondary sources and does not include primary data collection, limiting the depth of contextual understanding.

4.6. Research Gaps and Future Priorities

Several knowledge gaps emerge from this review, pointing to priorities for future research. Longitudinal socio-ecological studies are urgently needed to track changes in poverty, land degradation, and their interactions over time, and to assess the effectiveness of interventions [57, 58]. Panel data and repeated measurements would enable more rigorous causal inference [49, 50].

Gender-disaggregated analyses are essential for understanding how poverty and degradation differentially affect men and women, and how gender relations shape resource access, decision-making, and adaptive capacity [65]. Women's roles in natural resource management and their vulnerability to environmental change remain underexplored in Karamoja [37].

Integration of remote sensing and socioeconomic data would enable spatially explicit analyses of land degradation patterns and their socioeconomic correlates [52, 71]. Combining satellite imagery, household surveys, and participatory mapping could provide powerful insights into the nexus [40].

Institutional analysis is needed to understand how customary and formal institutions interact, how they can be strengthened, and how they mediate poverty–degradation dynamics [56]. Comparative studies of successful and

unsuccessful institutional arrangements would be valuable [26].

Climate adaptation research should focus on identifying effective strategies for enhancing resilience in the face of increasing climate variability and change, including drought-tolerant crops, improved water management, and climate-informed early warning systems [35, 31].

Political economy research is needed to analyze the power relations, interests, and incentives shaping land-use policy, resource governance, and development interventions in Karamoja [28, 64]. Understanding the political economy of land grabbing, mining, and conservation is critical for designing equitable policies [36].

5. Conclusion

This conceptual review has synthesized existing knowledge on the poverty–land degradation nexus in Karamoja, Uganda, revealing a complex, multidimensional, and institutionally mediated process. Poverty in Karamoja encompasses extreme income deprivation, livestock asset loss, chronic food insecurity, infrastructure deficits, social exclusion, and capability deprivation. Land degradation manifests through soil erosion, rangeland deterioration, deforestation, and climate-driven vegetation change.

Bidirectional feedback pathways link poverty and degradation: poverty compels resource-depleting coping strategies (charcoal production, overgrazing, agricultural expansion), while degradation reduces productivity and deepens impoverishment. However, these feedback loops are not deterministic but are mediated by institutions, mobility, asset endowments, and social protection mechanisms. The nexus is conditional, contingent on specific ecological, social, and institutional contexts.

Institutional and governance factors including commons enclosure, disarmament policies, tenure insecurity, and sedentarization programs play a central role in shaping the nexus. Historical marginalization, conflict, and policy failures have disrupted pastoral institutions and livelihoods, exacerbating both poverty and degradation.

Breaking the poverty–land degradation cycle in Karamoja requires integrated interventions that address structural drivers, strengthen tenure security, support adaptive pastoral mobility, diversify livelihoods, enhance climate resilience, and rebuild functional institutions. Policies must recognize the ecological rationality of pastoralism and engage local communities in participatory, rights-based approaches.

Future research should prioritize longitudinal socio-ecological studies, gender-disaggregated analyses, integration of remote sensing and socioeconomic data, institutional analysis, and political economy research. Understanding the poverty–land degradation nexus in Karamoja is not only an academic exercise but a critical foundation for designing effective, equitable, and sustainable development pathways in one of Africa's most vulnerable dryland regions.

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Conflicts of Interest

The authors declare no conflicts of interest.

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